



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04M 15/00	A1	(11) International Publication Number: WO 98/39910 (43) International Publication Date: 11 September 1998 (11.09.98)
---	----	---

(21) International Application Number: PCT/US98/02493

(22) International Filing Date: 9 February 1998 (09.02.98)

(30) Priority Data:
08/814,178 7 March 1997 (07.03.97) US

(71) Applicant: AT & T CORP. [US/US]; 32 Avenue of the Americas, New York, NY 10013-2412 (US).

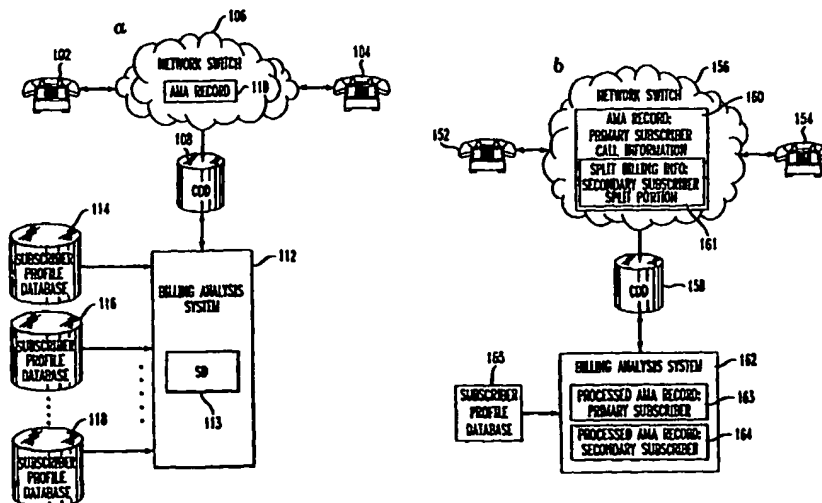
(72) Inventors: JAGADISH, Hosagrahar, V.; 16 Beech Avenue, Berkeley Heights, NJ 07922 (US). MUMICK, Inderpal, S.; 85 Swenson Circle, Berkeley Heights, NJ 07922 (US).

(74) Agents: DWORETSKY, Samuel, H. et al.; AT & T Corp., P.O. Box 4110, Middletown, NJ 07748 (US).

(81) Designated States: CA, JP, MX, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: DYNAMIC SPLIT BILLING OF TELEPHONE CALLS



(57) Abstract

A telephone call placed by an originating subscriber to a terminating subscriber is billed by first connecting the telephone call between the originating subscriber and the terminating subscriber. A signal initiating split billing is received, then a signal indicating a billing portion is received. Both the originating subscriber and the terminating subscriber are billed for at least a portion of the cost of the telephone call, based on the indicated billing portion. The billing portion may be specified as a percentage, a monetary value, or a time period. Split billing may be initiated by the originating subscriber in the situation in which the terminating subscriber was responsible for the entire cost of the call prior to split billing being initiated. Split billing may be initiated by the terminating subscriber in the situation in which the originating subscriber was responsible for the entire cost of the call prior to split billing being initiated.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

DYNAMIC SPLIT BILLING OF TELEPHONE CALLS

Field of the Invention

The present invention relates to the processing of telephone calls, and in particular, to the billing of the costs of such calls.

5 Background of the Invention

The cost of a telephone toll call placed between telephone subscribers is typically billed to the subscriber originating the call (originating subscriber). It is well-known to shift the entire cost of a call to the recipient of the call (terminating subscriber). For example, collect
10 calling allows a caller to shift the cost of individual calls to the terminating subscriber, with the permission of the terminating subscriber given on a call-by-call basis. Another example is Inward WATS or "800" number service, in which the cost of all calls placed to a particular number are shifted to the terminating subscriber.

15 It is known to shift a portion of the cost of a call on a predefined basis. For example, in the Telephone Call Billing System of Patent No.

5,381,467 to Rosinski et al., at least of portion of the period cost associated with at least one of the indivisible time periods of a toll call is assigned to both the terminating and originating subscribers. The apportionment of the basic cost of a call is automatically authorized according to a predetermined agreement as to the sharing of each of the call's period costs. An authorization signal is required in order for cost sharing to occur. In one embodiment, the authorization signal is automatically generated, if the originating subscriber meets predetermined criteria with respect to each call. In another embodiment, the authorization signal is developed in response to actions taken by the terminating subscriber after call setup by, for example, keying predefined codes via telephone keyboard. Thus, the terminating subscriber is given the option of accepting a predefined portion of the cost of a call, or allowing the originating subscriber to pay the entire cost of the call. This prior art system does not provide a subscriber with the capability to define a cost sharing arrangement after the call has been connected. In addition, this system only provides cost sharing

when the subscriber that would not normally be charged for the call is the terminating subscriber

In the telephone billing method of Patent No. 5,146,491 to Silver et al., a toll-free number is provided to a customer to access a provider in a toll-free call from an originating customer telephone number. The originating customer telephone number is received in response to the toll-free call. The toll-free call is converted to a billable call during or after the toll-free call and the billable call is billed to the originating customer telephone number. This method provides the capability to charge goods or services that are purchased by the originating customer to the originating customer's telephone bill. The monetary amounts charged to the customer depend on the items purchased, not on the actual cost of the telephone call. It does not provide cost sharing of the cost of the telephone call.

It is desirable to provide the capability to define an arrangement for sharing the cost of a telephone call after the call has been connected. Likewise, it is desirable to provide cost sharing capability to the subscriber that would not normally be charged for the call, regardless of

whether that party is the originating subscriber or the terminating subscriber.

Summary of the Invention

5 The present invention is a method and system for billing a telephone call which provides a subscriber with the capability to define an arrangement for sharing the cost of a telephone call after the call has been connected. It provides cost sharing capability to the subscriber that would not normally be charged for the call, regardless of whether that
10 party is the originating subscriber or the terminating subscriber

A telephone call placed by an originating subscriber to a terminating subscriber is billed by first connecting the telephone call between the originating subscriber and the terminating subscriber. A signal initiating split billing is received, then a signal indicating a billing
15 portion is received. Both the originating subscriber and the terminating subscriber are billed for at least a portion of the cost of the telephone call, based on the indicated billing portion.

The billing portion may be specified as a percentage, a monetary value, or a time period. Split billing may be initiated by the originating subscriber in the situation in which the terminating subscriber was responsible for the entire cost of the call prior to split billing being initiated. Split billing may be initiated by the terminating subscriber in the situation in which the originating subscriber was responsible for the entire cost of the call prior to split billing being initiated.

Brief Description of the Drawings

10 The details of the present invention, both as to its structure and operation, can best be understood by referring to the accompanying drawings, in which like reference numbers and designations refer to like elements.

Fig. 1a is a block diagram of one embodiment a telephone call
15 billing system, in which the present invention may be implemented.

Fig. 1b is a block diagram of the telephone call billing system of Fig. 1a, showing AMA records according to the present invention.

Fig. 2a is a flow diagram of the operation of a dynamic split billing process according to the present invention.

Fig. 2b is a flowchart depicting the steps involved in a procedure that a billing analysis system may use to perform dynamic split billing processing for each call, according to the present invention.

Fig. 3 is a block diagram of another embodiment of a telephone call billing system, in which the present invention may be implemented.

Fig. 4 is a block diagram of another embodiment of a telephone call billing system, in which the present invention may be implemented.

Detailed Description of the Invention

Referring to Fig. 1a, there is shown a block diagram of a telephone system in accordance with one embodiment of the present invention. There is shown a calling telephone 102, a called telephone 104, a telephone network switch 106 and a Call Detail Database

(CDD) 108. An Automatic Message Accounting (AMA) record, represented by a block 110, is also shown. As indicated by the figure, a billable call may be initiated at telephone 102 and routed through switch 106, e.g., an AT&T 4ESS switch, to telephone 104. The switch generates AMA record 110, which includes the information necessary to rate the call. The AMA record is passed to CDD 108. It should be noted here that there are an abundance of protocols and transmission media that may be used for passing the data from the switch to the CDD. For example, suitable protocols include the well known File Transfer Protocol (FTP) and Transmission Control Protocol/Internet Protocol; and suitable transmission media include twisted shielded pair wires, fiber optic lines, coaxial cable, and wireless links. Moreover, these protocols and media are suitable for use in all data transfers and queries hereinafter described.

In any event, once the AMA record has been passed to the CDD, it is available for use in pricing the call. To this end, the AMA record is passed to a billing analysis system 112, which may be a general purpose computer capable of running the software necessary to

implement the invention. The billing analysis system applies any subscriber specific billing parameters to the AMA record to produce a processed AMA record. It then passes both the AMA record and the processed AMA record back to the CDD for storage. A method for
5 passing the data back to the CDD is disclosed in co-pending, commonly assigned, US Patent Application Serial No.: 08/607,983 - entitled "Compression and Buffering of a Stream with Data Extraction Requirements" - which application is incorporated herein by reference.

The billing analysis system performs its functions the instant the
10 switch passes the AMA record to the CDD (i.e. it performs call pricing in real-time). In order to achieve real-time processing of AMA records the invention must overcome two primary obstacles. First, the subscriber specific data is fragmented across multiple business units, with no cohesive notion of an integrated subscriber
15 profile. This situation is depicted in Fig. 1a, which shows several subscriber profile databases 114, 116 and 118. As shown in the figure, the invention overcomes this obstacle through the use of an integrated subscriber profile database located within the billing

analysis system. Software tools update the integrated subscriber profile database in response to updates of the individual subscriber profiles 114, 116 and 118 so that the integrated database always contains current information on all subscribers.

5 The volume of subscriber and telephone call data makes it difficult to store, rate, and query call data in real-time. To surmount this obstacle the invention accumulates summary information as each individual call (AMA) record is received and rated in real-time. It is generally desirable for a telephone network to maintain a subscriber's
10 current bill. Thus, one type of accumulated summary information may be current bills for each network subscriber. Nevertheless, it may be useful to accumulate other types of summary information for particular subscribers. The nature of the accumulated summary information for a particular subscriber depends upon the services subscribed to by that
15 subscriber. For example, a subscriber may subscribe to a plan in which calls made during the hours between 5:00pm and 9:00am receive a 10% discount; in which case it is useful to maintain a

summary field containing the number of minutes of calls that the subscriber has made during the discount period.

In any case, the summary information is stored in a Summary Database (SD) 113 that is located within the billing analysis system.

5 Thus, in this embodiment, AMA records and processed AMA records are stored in the CDD, while summary information is stored in the SD. It should be noted that many alternative storage schemes may be employed without departing from the spirit of the invention. For example, in one alternative scheme, AMA records are stored in the
10 CDD, summary information are stored in the SD, and processed AMA records are stored in both the CDD and SD.

The processing involved in dynamic split billing is shown in Fig. 1b, which, as an example, shows the present invention implemented in the telephone billing system of Fig. 1a. The present invention may be
15 similarly implemented in the telephone billing systems shown in Figs. 3 and 4.

A subscriber places a call from calling station 152. Each call is routed through a network switch 156, which generates a corresponding

AMA record 160. The AMA record includes an indication of a primary subscriber for the AMA record and the call information needed to determine the cost of the call. Typically, the primary subscriber is the subscriber who would pay for the call if split billing is not invoked. The

5 AMA record also includes split billing information 161, which includes an indication of the secondary subscriber and the split portion, which is the portion of the cost of the call that the secondary subscriber will pay. The split portion may be indicated in several ways, such as a maximum monetary value, a percentage of the cost of

10 the call, or by a number of minutes of the call.

The present invention handles split billing for both inbound and outbound services. In outbound service, the originating subscriber is initially responsible for the cost of the call. The terminating subscriber may initiate split billing if desired. The originating subscriber is

15 indicated as the primary subscriber in the AMA record. The Automatic Number Identification (ANI) is used for this purpose. In an ANI system, the number of the telephone station from which a call is initiated is determined and used to identify the party who initiated the

call. The terminating subscriber is indicated as the secondary subscriber in the AMA record. The dialed number is used for this purpose.

In inbound service, the terminating subscriber is initially
5 responsible for the cost of the call. The originating subscriber may initiate split billing if desired. The terminating subscriber is indicated as the primary subscriber in the AMA record. The dialed number is used for this purpose. The originating subscriber is indicated as the secondary subscriber in the AMA record. The ANI is used for this
10 purpose.

The AMA record is passed to CDD 158, making the record available for call pricing. The AMA record is passed from CDD 158 to billing analysis system 162, which determines the cost of the call. Billing analysis system 162 determines a total cost of the call based on
15 the call information in the AMA record. Billing analysis system 162 also determines the portion of the total cost of the call that is to be paid by the secondary subscriber, based on the information in split billing information 161. Billing analysis system 162 then generates processed

AMA record 163, which includes the charges for the call that are to be billed to the primary subscriber, and processed AMA record 164, which includes the charges for the call that are to be billed to the secondary subscriber. The AMA records are generated based on each subscriber's profile in the subscriber profile databases connected to billing analysis system 162, such as subscriber profile database 165. AMA records 163 and 164 are then passed back to CDD 158, where they are stored until billed to the subscriber.

A flow diagram of the operation of a dynamic split billing process is shown in Fig. 2a. The process begins with an originating subscriber placing a call to a terminating subscriber (step 202). The secondary subscriber in the call, which is the terminating subscriber in outbound service and the originating subscriber in inbound service, initiates split billing (step 204). Split billing may be indicated by entering a first touch-tone code into the keypad of a telephone station, or by transmitting the touch-tone code from a computer, or a signaling code from a PBX. The code is received by network switch 156, which typically indicates receipt of the first touch-tone code by transmitting an

audio prompt, such as a tone or voice message, to the secondary subscriber. The secondary subscriber then indicates the portion of the call for which he will pay (step 206). The portion may be indicated by entering a second touch-tone code into the keypad of the telephone state,
5 or by transmission from a computer or PBX.

Network switch 156 then generates an AMA record 160, including the primary subscriber, call information and split billing information including the secondary subscriber and the split portion (step 208). The AMA record is passed to the CDD (step 208). The
10 billing analysis system then performs the processing necessary to bill both the primary subscriber and the secondary subscriber for their respective portions of the cost of the call (step 210).

Fig. 2b shows, in flowchart form, a procedure that a billing analysis system may use to perform dynamic split billing processing
15 for each call. In the following description of the flowchart references will be made to the embodiment shown in Fig. 1b.

Upon receiving an AMA record, such as 160a from CDD 158, the first step billing analysis system 162 takes is to rate the total call

(step 252). It then determines the portion of the total call that is to be paid by the secondary subscriber from the information in split billing information 161 (step 254). The portion to be paid by the primary subscriber is the remainder of the cost of the call. This is also
5 determined (step 254). It must then match the rated call to the subscriber so that subscriber specific parameters can be applied to the call (step 256). Several well known techniques can be used to match the rated call to the subscriber. One such technique uses Automatic Number Identification (ANI). In an ANI system, the number of the
10 telephone station from which a call is initiated is determined and used to identify the party, the originating subscriber, who initiated the call. The terminating subscriber may be identified based on the dialed number. Accordingly, in the Fig. 1b embodiment, the number of a telephone, such as 152 or 154, may be determined and passed to the
15 billing analysis system along with the AMA record. The billing analysis system may then cross-reference the number to the subscriber profile containing the subscriber specific data to be used for the current call.

Once the appropriate profiles have been determined, the billing analysis system applies the subscriber specific data contained in the profiles to the rated call to produce a priced call value for the primary subscriber's portion of the call and for the secondary subscriber's portion of the call (step 256). Each priced call value may be added to the respective subscriber's previous balance to create a new balance, or "current bill" for each subscriber (step 258). Finally, the priced call value (processed AMA record) for each subscriber is stored in the CDD, and the current bill (summary information) for each subscriber is stored in the SD (step 262). As described in relation to Fig. 1a, an alternative scheme is to store both the priced call value and current bill - collectively termed "the priced call data" - in the SD; in which case, step 262 would involve storing the priced call value and the current bill in the SD.

As an optional step in the procedure of Fig. 2b, the billing analysis system may adjust charges for old calls to reflect certain types of billing plans, such as usage based discount billing plans (step 260).

Referring now to Fig. 3, there is shown an alternative embodiment of a telephone system in accordance with the present invention. The subscriber profiles are not shown, but are similar to those shown in Fig. 1b. As shown in the figure, a call may be initiated at a first telephone 302 and directed to a second telephone 304. The call is routed by a network switch 306, which generates an AMA record 310 for the call. The AMA record is passed to a billing analysis system 312 which applies subscriber specific parameters to the AMA record to produce a processed AMA record. The AMA record and processed AMA record are then passed to a CDD 308 for storage.

Like the billing analysis system of Fig. 1b, the billing analysis system of Fig. 3 includes a SD 313. The billing analysis system of Fig. 3 also includes an integrated subscriber profile - although, it should be noted that for simplicity of presentation the individual subscriber profile databases are not shown in Fig. 3, nor in the figures that follow. Also, like the billing analysis system of Fig. 1a, the billing analysis system of Fig. 3 accumulates summary information as each individual call record is received and rated in real-time, the

summary information being stored in the SD 313. As in the prior described embodiment, alternative schemes may be employed for the storage of the AMA records, processed AMA records, and summary information.

5 Fig. 4 shows another embodiment of a telephone system in accordance with the present invention. The subscriber profiles are not shown, but are similar to those shown in Fig. 1b. In the Figure 4 embodiment, as in the previous embodiments, a call initiated at a first telephone 402 may be directed to a second telephone 404 through a
10 network switch 406, which generates an AMA record 410. However, in the Fig. 4 embodiment the AMA record is passed to a Rating Complex (RC) 412. The RC is a unit which performs the functions of the CDD and billing analysis system, and may therefore be characterized as a combined CDD and billing analysis system. As
15 shown in the figure, the RC may include a SD 413 for storing the summary information separately from the AMA records and processed AMA records. As in the prior described embodiments, alternative

schemes may be employed for the storage of the AMA records, processed AMA records, and summary information.

It should be noted that although all three embodiments discussed above depict a call as being initiated from a first telephone and
5 directed to a second telephone, it is possible that calls may be initiated by, and directed to, many different types of communication devices. For example, a call may be initiated by a fax machine and directed to a personal computer. Moreover, a call may be initiated by a single communication device and directed to multiple communication
10 devices. For example, a call may be initiated by a fax machine and directed to multiple independent personal computers. For purposes of this description, each instance of a single initiating call being directed to a different terminating device will be considered an independent call.

15 Although specific embodiments of the present invention have been described, it will be understood by those of skill in the art that there are other embodiments which are equivalent to the described embodiments. Accordingly, it is to be understood that the invention is not to be limited

by the specific illustrated embodiments, but only by the scope of the appended claims.

CLAIMS

1 1. A method of billing a telephone call placed by an originating
2 subscriber to a terminating subscriber, comprising the steps of:
3 connecting the telephone call between the originating subscriber
4 and the terminating subscriber;
5 receiving a signal initiating split billing;
6 receiving a signal indicating a billing portion; and
7 billing the both the originating subscriber and the terminating
8 subscriber for at least a portion of the cost of the telephone call, based
9 on the indicated billing portion.

1 2. The method of claim 1, wherein the billing portion is specified as
2 a percentage.

1 3. The method of claim 2, wherein the specified percentage is less
2 than 100%.

1 4. The method of claim 2, wherein the specified billing portion
2 equals 100%.

1 5. The method of claim 1, wherein the billing portion is specified as
2 a monetary value.

1 6. The method of claim 1, wherein the billing portion is specified as
2 a time period.

1 7. The method of claim 1, wherein split billing is initiated by the
2 originating subscriber.

1 8. The method of claim 7, wherein the terminating subscriber was
2 responsible for the entire cost of the call prior to split billing being
3 initiated.

1 9. The method of claim 1, wherein split billing is initiated by the
2 terminating subscriber.

1 10. The method of claim 9, wherein the originating subscriber was
2 responsible for the entire cost of the call prior to split billing being
3 initiated.

1 11. A system for billing a telephone call placed by an originating
2 subscriber to a terminating subscriber, comprising the steps of:

3 a switching device connecting the telephone call between the
4 originating subscriber and the terminating subscriber;

5 a first receiver, coupled to the switching device, receiving a signal
6 initiating split billing;

7 a second receiver, coupled to the switching device, receiving a
8 signal indicating a billing portion; and

9 a billing device, coupled to the second receiver, billing the both
10 the originating subscriber and the terminating subscriber for at least a
11 portion of the cost of the telephone call, based on the indicated billing
12 portion.

1 12. The system of claim 11, wherein the billing portion is specified as
2 a percentage.

1 13. The system of claim 12, wherein the specified percentage is less
2 than 100%.

1 14. A system for billing a telephone call placed by an originating
2 subscriber to a terminating subscriber, comprising the steps of:

3 means for connecting the telephone call between the originating
4 subscriber and the terminating subscriber;

5 a means for receiving a signal initiating split billing, coupled to
6 the connecting means;

7 a second means for receiving a signal indicating a billing portion,
8 coupled to the switching device; and

9 means for billing both the originating subscriber and the
10 terminating subscriber, coupled to the second receiver, billing each
11 subscriber for at least a portion of the cost of the telephone call, based
12 on the indicated billing portion.

1 15. The system of claim 14, wherein the billing portion is specified as
2 a percentage.

1 16. The system of claim 15, wherein the specified percentage is less
2 than 100%.

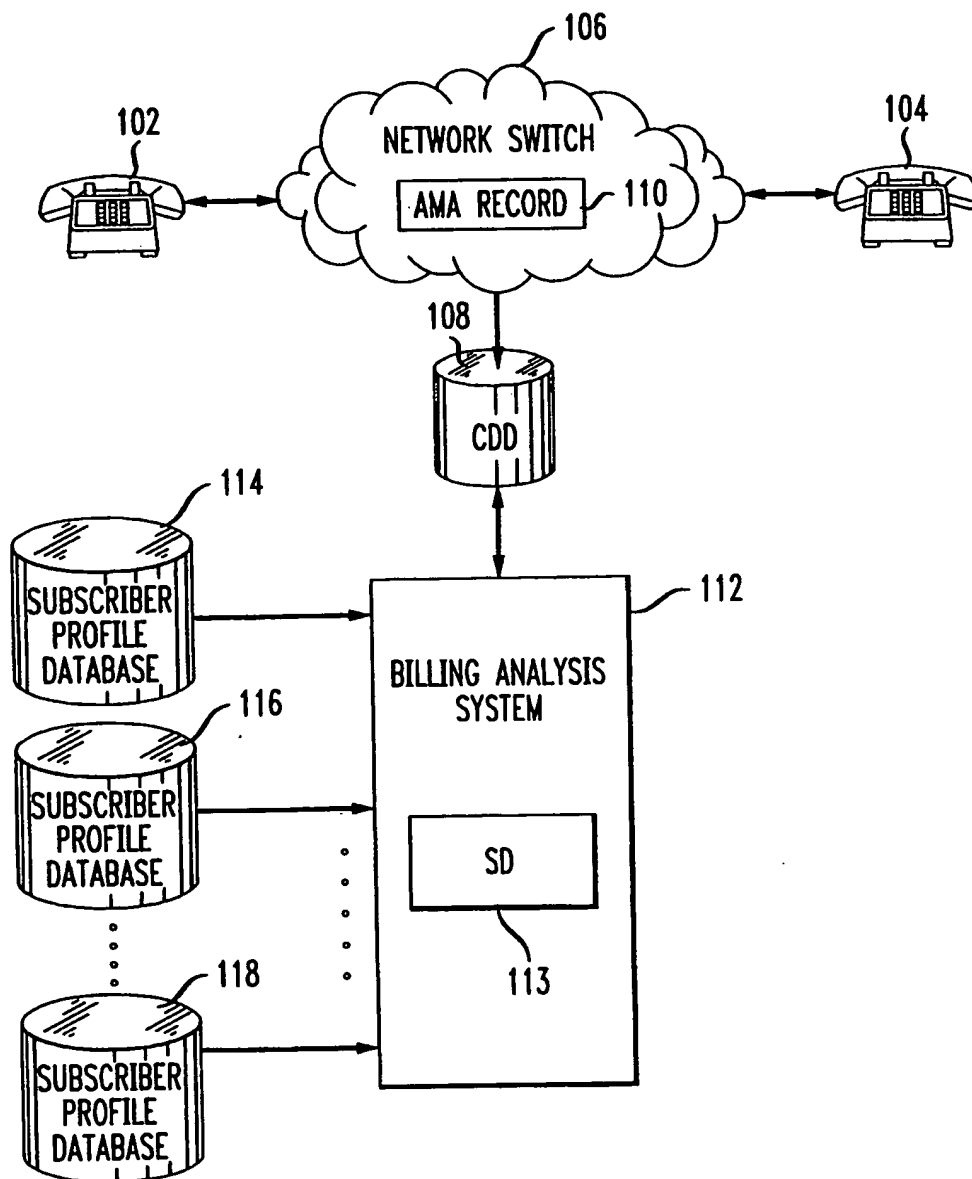
1 17. The system of claim 15, wherein the specified billing portion
2 equals 100%.

1 18. The system of claim 14, wherein the billing portion is specified as
2 a monetary value.

1 19. The system of claim 14, wherein the billing portion is specified as
2 a time period.

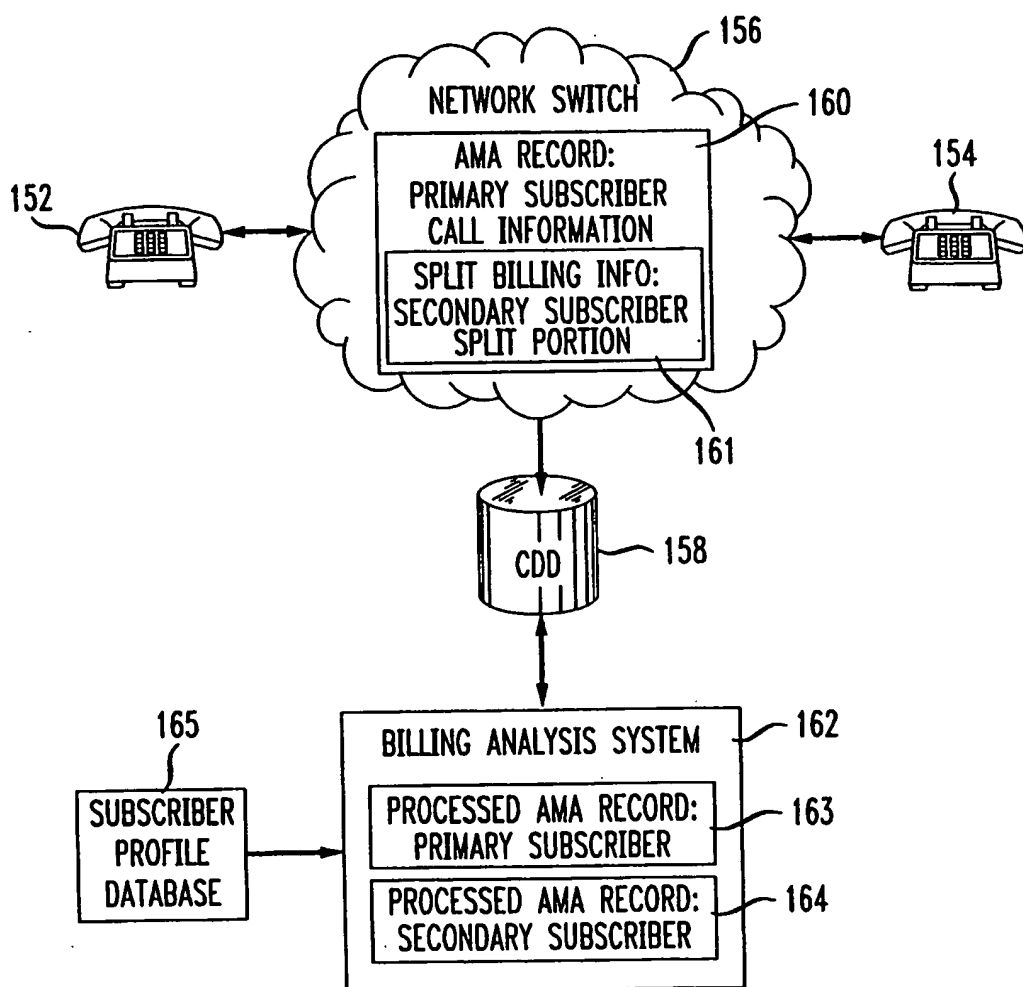
1/5

FIG. 1a



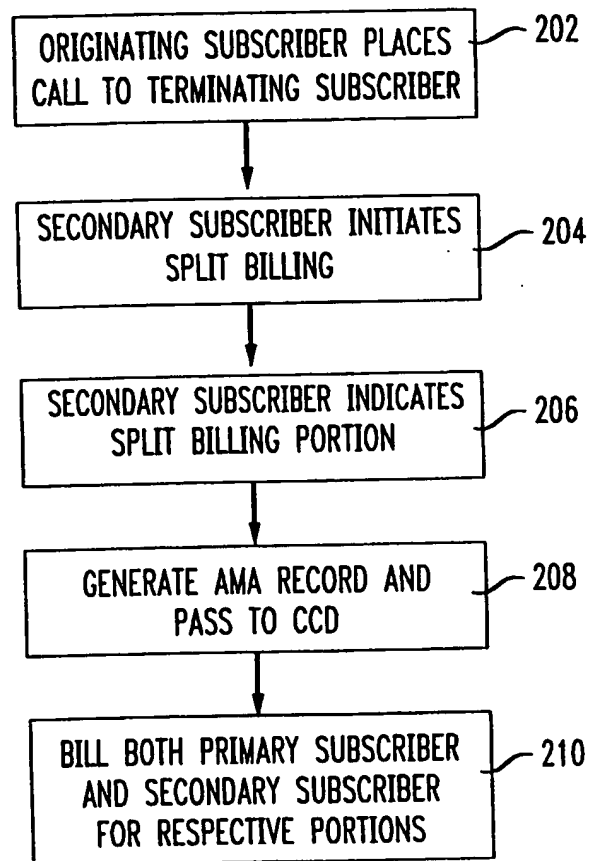
2/5

FIG. 1b



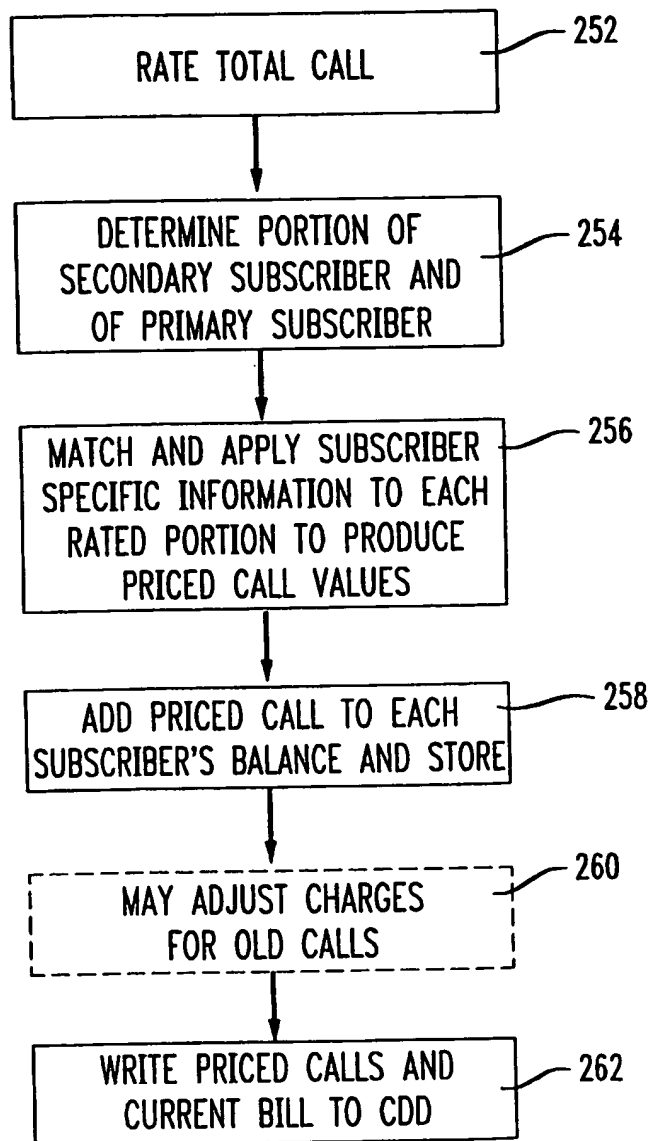
3/5

FIG. 2a



4/5

FIG. 2b



5/5

FIG. 3

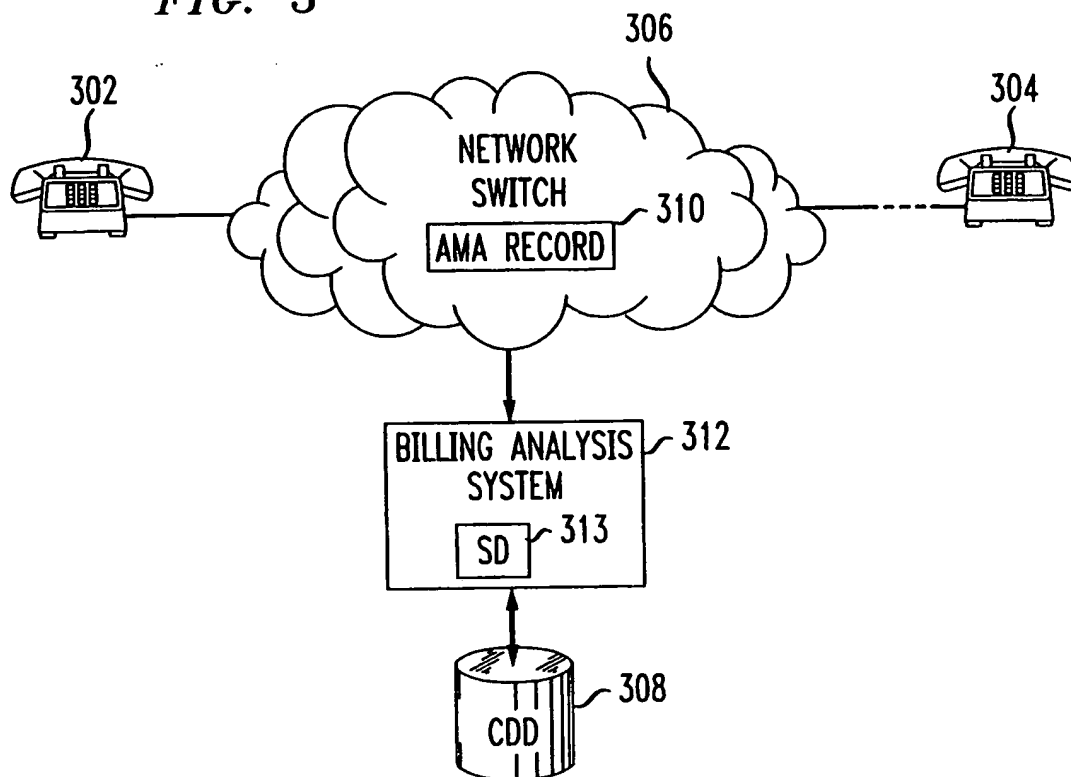
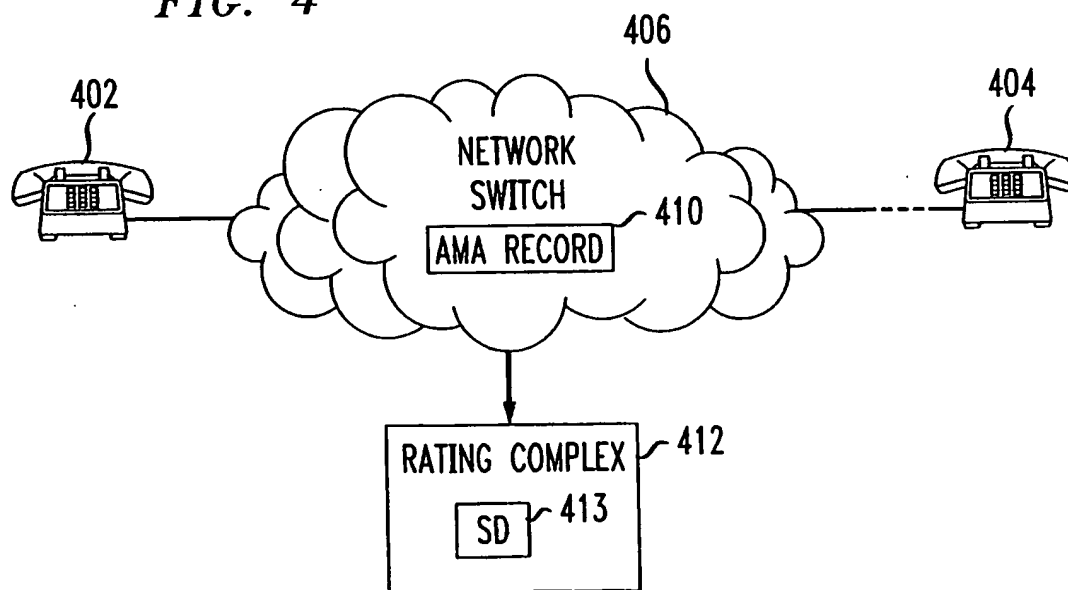


FIG. 4



INTERNATIONAL SEARCH REPORT

national Application No
PCT/US 98/02493

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04M15/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 602 907 A (HATA EMI ET AL) 11 February 1997	1-4, 7-17
Y	see column 2, line 51 - column 3, line 55 see column 10, line 1 - line 2 see figures 2, 16 see claims 1, 4, 9	5, 6, 18, 19
Y	PATENT ABSTRACTS OF JAPAN vol. 012, no. 049 (E-582), 13 February 1988 & JP 62 196969 A (MITSUBISHI ELECTRIC CORP), 31 August 1987, see abstract	5, 6, 18, 19
A		1-4, 7, 8, 11-17
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

3 June 1998

Date of mailing of the international search report

10/06/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Neves Appelt, D

INTERNATIONAL SEARCH REPORT

national Application No
PCT/US 98/02493

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 381 467 A (ROSINSKI RICHARD R ET AL) 10 January 1995 cited in the application	1-4,7-17
Y	see column 2, line 1 - line 59 see column 6, line 23 - line 68 see column 11, line 15 - line 25 see column 14, line 61 - column 15, line 47 see claim 18	5,6,18, 19
Y A	WO 96 03000 A (BRITISH TELECOM ;SWALE RICHARD PAUL ET AL.) 1 February 1996 see page 2, line 21 - line 31 see page 5, line 19 - page 6, line 6	5,6,18, 19 1,7-11, 14
X	PATENT ABSTRACTS OF JAPAN vol. 095, no. 001, 28 February 1995 & JP 06 296205 A (FUJITSU LTD;OTHERS: 01), 21 October 1994, see abstract	1-3,9-16
A	PATENT ABSTRACTS OF JAPAN vol. 096, no. 003, 29 March 1996 & JP 07 307814 A (NEC CORP), 21 November 1995, see abstract	1-3,7, 11-16
A	US 5 146 491 A (SILVER DAVID ET AL) 8 September 1992 cited in the application see claims 1,2,5,8,11,13	1,5-8, 11,14, 18,19

INTERNATIONAL SEARCH REPORT

Information on patent family members

national Application No

PCT/US 98/02493

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5602907	A	11-02-1997	JP 7212500 A	11-08-1995
US 5381467	A	10-01-1995	CA 2101305 A,C	01-05-1994
WO 9603000	A	01-02-1996	AU 682779 B	16-10-1997
			AU 2932795 A	16-02-1996
			CA 2196325 A	01-02-1996
			EP 0770299 A	02-05-1997
			FI 970135 A	14-01-1997
			JP 10502781 T	10-03-1998
			NO 970143 A	13-03-1997
US 5146491	A	08-09-1992	NONE	